

# MEDICAL EVALUATION OF EFFICIENCY OF OPTIMIZED MODELS FOR EARLY DETECTION AND PRIMARY PREVENTION OF CARDIOVASCULAR DISEASES

Vyacheslav M. Zhdan, Irina A. Holovanova, Valentina L. Filatova, Maxim V. Khorosh

HIGH STATE EDUCATION ESTABLISHMENT OF UKRAINE "UKRAINIAN MEDICAL STOMATOLOGICAL ACADEMY", POLTAVA, UKRAINE

## ABSTRACT

**Introduction.** Nowadays cardiovascular disease occupies a leading place in the structure of the prevalence, incidence, disability causes and mortality of the adult population in Ukraine and in the whole world. The prevalence of hypertension in the adult population ranges from 25 - 40%, coronary heart disease is almost 20% of people aged 50-59 years while 24.3% of them have a form of silent coronary artery disease. The feasibility of study is justified by the need to perform health institutions Law of Ukraine dated 07.07.2011 year №3611-VI «On Amendments to the Basic Laws of Ukraine on health care on improvement of care» and MoH of Ukraine from 24.07.2013 № 621/60 "On the system of cardiac care in health facilities of Ukraine" therefore extremely important is to develop an optimized model of early detection and primary prevention of cardiovascular diseases at primary level of health care.

**The aim** of the research is to develop methods and evaluation models optimized for early detection and primary prevention of cardiovascular diseases at a general practitioner of family medicine.

**Material and Methods.** The methodical apparatus is of complex of medical and social research methods that meet the requirements of public health: bibliosemantic, systematic approach and analysis, statistical, expert evaluations. To determine the effectiveness of medical evaluation was conducted in its 33 clinics of general practice in Poltava region, including 7 urban and 26 rural. In expert opinion is taken 825 patients, of which 175 urban and 650 in rural areas.

**The results** of the study found that 193 patients (23.4%) achieved target blood pressure through the implementation of the recommendations concerning the optimization behavior towards of risk factors, lifestyle.

**KEYWORDS:** healthy lifestyle, early detection of diseases, primary prevention, diseases of the cardiovascular system.

Wiad Lek 2017, 70, 3, cz. I, 433-438

## INTRODUCTION

In recent decades, the problem of cardiovascular disease is becoming more important in the realities of the modern world. Cardiovascular disease is a leader in the structure of the global epidemic of non-communicable diseases. According to the World Health Organization, the World Heart Federation, and according to the Center of Health Statistics of Ukraine cardiovascular disease ranks the first places in the structure of morbidity, disability and mortality both in Ukraine and throughout the world [1].

In discussing of the problem of cardiovascular risk there is using a model that includes age, risk factors and lifestyle as a parameter that is defined as "age of cardiovascular risk" [2]. Despite the fact that the "epidemiological bias" more typical of countries with high-income countries (US, Western Europe), but it occurs to some extent in the middle and low income countries, and developing countries [3]. It should to be noted that the most vulnerable group is younger people from economically weaker social and ethnic groups or regions [3, 4]. This pattern is due to shortcomings of regional health systems, shown insufficient control of hypertension and risk factors [5].

In recent years, the prevalence of cardiovascular diseases in Ukraine increased by about 1.8 times [6] and in

the structure of the prevalence the first ranks is arterial hypertension, which is generally referred as "diseases of civilization". The prevalence of hypertension in the adult population ranges from 25 - 40%. In turn, hypertension is a major risk factor for coronary heart disease, acute cerebral circulatory and renal insufficiency.

The most common disease in most economically developed countries is coronary heart disease, which occupies a leading place among all causes of morbidity, mortality, temporary and permanent disability. According to epidemiological studies of coronary heart disease is almost 20% of people aged 50-59 years while 24.3% of them have a form of silent coronary artery disease. Such people usually do not seek treatment, and because they observed the highest incidence of acute myocardial infarction and sudden coronary death [7].

According to the World Heart Federation, nearly 80% of premature deaths from heart attacks and strokes are preventable if you keep control of the main risk factors for cardiovascular disease, such as excess body weight, blood pressure (especially systolic), total cholesterol and low-density lipoprotein cholesterol [8].

Of all the deaths caused by cardiovascular diseases, due to complications of hypertension occurs 9.4 million deaths

worldwide each year, 7.4 million resulting from coronary heart disease. The share hypertension accounts for at least 45% of deaths caused by heart disease, and 51% of deaths caused by stroke. However, complications of coronary heart disease and stroke kills 12 million people each year [9].

## THE AIM

The study aims to determine the model of medical efficiency, improved early detection and primary prevention of cardiovascular diseases as part of medical care at the primary level.

## MATERIALS AND METHODS

The methodical apparatus is a complex of medical and social research methods, generally defined as scientific research direction and content of research in the spectrum of social medicine: bibliosemantic (for analysis of scientific literature), systematic approach and analysis (to applied at all stages of development and for solving problems of systems research), statistical (descriptive and analytical methods to determine statistical ratios, their errors likelihood difference parameters, multiple regression analysis), of expert assessments (to determine the feasibility of the proposed model of primary health care).

The basic data which used to assess the effectiveness of primary prevention models were discharged from medical records of patients diagnosed with a primary cardiovascular disease - isolated hypertension or hypertension in conjunction with coronary artery disease.

## RESULTS AND DISCUSSION

To modernize the lifestyle and the primary prevention of cardiovascular diseases is necessary given the demographic factors that promote behavior change to so influence the formation of human healthy life.

Note that actions related to behavior change can be aimed at different levels of life - individual, family, group and population level. At the same time the result of applied effort will not necessarily manifest itself at the same level, where the applied force, such as the impact on the population level can yield results at the individual level and the impact on the family level manifests itself at level groups. Taking note of behavioral factors such as the nature of eating behavior dominated by the use of animal proteins, disturbing dream that lasts less than 6 hours, passive recreation, strained family relations, nervous and mental fatigue, smoking, alcohol abuse and, result of this behavior, obesity, measures should be carried out at different levels of care that will reduce the incidence of cardiovascular diseases [10, 11].

To overcome these major risk factors that influence the development of heart disease and was built by our functional and organizational structure of the primary prevention of cardiovascular diseases in the population, group and individual levels. [12, 13].

At the state level for the successful implementation of a

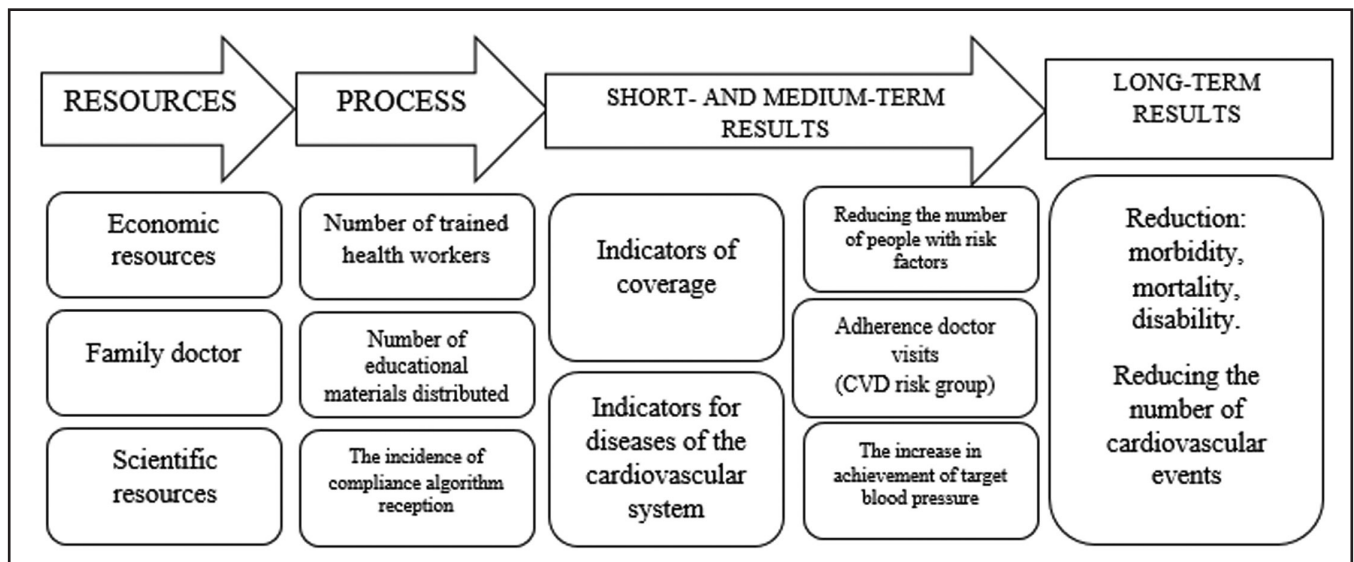
healthy lifestyle in the community need legal regulation: the creation of a number of laws that promote it. The main tasks of the State preventive programs aimed at supporting healthy lifestyles and the fight against cardiovascular diseases is to support cross-sectoral policy development process in public health; implementation of strategies for strengthening measures of health education in primary and secondary schools; increase public awareness of risk factors for noncommunicable diseases, ways to reduce and encourage healthy behavior on major non-communicable diseases; reduce premature deaths from cardiovascular disease, cancer, diabetes and chronic respiratory diseases by 25%; reduce alcohol abuse by 10%; reducing the prevalence of inadequate physical activity by 10%; 30% reduction in the average salt consumption; a decrease of 18.5% prevalence of tobacco use; stop growing incidence of obesity and diabetes; improve the overall availability of medical care and other services in the health sector [14].

At the group level local government previously is conducted needs of assessment and action, based on the demographic structure of the local population in need of primary prevention and health care; intervention planning for it to be as easy as possible for people; identifies available locally assets (health care, local communities, volunteer groups, etc), that will work towards improving health; involves cooperation between higher public educational and health facilities and community activists, thus implementing national programs on the local level. Teachers medical institutions prepare and teach students, volunteers and physicians conduct health education activities among communities and individual.

Measures, implemented at the population group level and contribute to the formation of public opinion of the population on the importance of a healthy lifestyle. Then, at the individual level when it becomes popular and affordable maintain a healthy lifestyle is easier to influence a person's world. It was great at the individual level, primary importance is the general practitioner of family medicine, the patient trusts. General practitioners will be easier to work with the patient, who has installed on healthy lifestyle and understands the danger of occurrence of risk factors for cardiovascular diseases.

For the successful implementation of primary prevention of cardiovascular diseases was built by us and implemented a model of intersectoral cooperation in the prevention of cardiovascular diseases (for example, Poltava region). The resources were proposed modli local authorities, local media, the Department of Health Care Management at the Poltava regional state administration, centers of primary health and social care, general practitioners and persons equated to them, Faculty of postgraduate education of medical school.

The main objectives of intersectoral strategies include the implementation of a national plan of prevention of cardiovascular diseases at the regional level to bring to the entire population of the danger of risk factors for cardiovascular diseases and on primary prevention of cardiovascular diseases, assess the availability, effectiveness and quality



**Fig 1.** Scheme evaluation model for early detection of primary prevention of cardiovascular diseases

of primary prevention of cardiovascular diseases, teach a patient algorithm actions for primary prevention of cardiovascular diseases, teach family doctors to algorithm of actions for early detection and primary prevention of cardiovascular diseases.

The proposed model allows general practitioners to work in favorable conditions, understanding and support of power consolidation efforts on the importance of prevention of cardiovascular diseases, carry out preventive work aimed at identifying risk factors early and latent forms of diseases, organize and carry out a complex of measures on clinical examination station (detection, registration, conducting therapeutic measures) and monitoring the state of his health, conduct sanitary-antiepidemic and sanitary-educational work among the population station.

Our logistic model of intersectoral interaction for early detection and primary prevention of cardiovascular diseases, we consider the figure of a general practitioner, as a member of a great team, action and style of work which aimed to overcome cardiovascular diseases. The algorithm of the general practitioner is considered by us, as part of medical care on admission to outpatient services or patient.

When referring patients with any pathology in determining the status of the objective, it is necessary to carefully take the anamnesis, conduct an objective examination, measure blood pressure on both arms or legs, conduct research vessels auscultation of the neck and renal arteries.

When interviewing the patient turn his attention to the risk factors that we present in the form of a brief questionnaire in order to reduce the time. The trained sister medical conducts the measurement of blood pressure in the arms and/or legs (determination of ankle-brachial index, asthenic build the patient's vascular lesions of the upper extremities, the inability to measure at hand, etc), a general practitioner auscultate the vessels of the neck, allowing auscultation suspected atherosclerotic changes in the vessels and hear noises in violation of valvular heart

and renal arteries - this allows you to hear signs of stenotic lesions of the renal arteries, which causes of so-called vasorenal arterial hypertension).

Patients who have risk factors irrespective of the numbers of blood pressure prescribed laboratory (complete blood and urine, determination of blood glucose, blood electrolytes (potassium levels and sodium) determining serum creatinine, blood lipids (cholesterol, LDL, triglycerides)) and instrumental (ECG, Echo-cardioscopy, ultrasound of the abdomen and kidney, ophthalmoscopy) investigation. If necessary, it is appropriate to use additional methods of examination – doppler of carotid arteries, determine the daily proteinuria, determination of ankle-brachial index, of glucose-tolerance test, determination of the pulse wave.

All patients with high blood pressure or risk factors of cardiovascular diseases appropriate to recommend of ambulatory blood pressure monitoring.

All patients seem attraction, and recommendations that include: practical advice on self-monitoring of blood pressure and other risk factors; recommendations to correct risk factors; changes in body weight, recommendations for the damage of excessive salt intake, for the benefit of limited use of tea and coffee, on optimization mode of physical activity, on reducing the use products with high containing of cholesterol, on the need for smoking cessation.

For the evaluation, we considered our intervention as a set of actions to consistently implement the changes identified or receiving results. Over the past few years using this scheme avowed Resources → Process → Results (Fig. 1).

To determine the effectiveness of medical evaluation was conducted of 33 family medicine clinics Poltava region, including 7 urban and 26 rural. In expert opinion is taken 825 patients, of which 175 urban and 650 in rural areas.

In the evaluation found:

- Anamnesis was taking in 726 patients (88%);
- Physical examination was conducted in 814 patients (98.7%);

**Table 1.** Evaluation results of indicators of model of primary prevention of cardiovascular diseases as part of medical care at the primary level

	City		Village		X	P
	Yes	No	Yes	No		
Anamnesis	156 (21,5%)	19 (19,2%)	570 (78,5%)	80 (80,8%)	0,275	0,600
Physical examination	173 (21,3%)	2 (18,2%)	641 (78,7%)	9 (81,8%)	0,061	0,805
Blood pressure on both arms	158 (29,0%)	17 (6,0%)	386 (71,0%)	264 (94,0%)	58,620	0,001
Blood pressure on the legs	5 (38,5%)	170 (20,9%)	8 (61,5%)	642 (79,1%)	2,352	0,125
Auscultation of the neck vessels	4 (13,3%)	171 (21,5%)	26 (86,7%)	624 (78,5%)	1,156	0,282
Auscultation of the renal arteries	2 (16,7%)	173 (21,3%)	10 (83,3%)	640 (78,7%)	0,151	0,698
Complete blood analysis	170 (21,3%)	5 (19,2%)	629 (78,7%)	21 (80,8%)	0,063	0,802
Urinalysis	166 (21,0%)	9 (27,3%)	626 (79,0%)	24 (72,7%)	0,755	0,385
Blood level of glucose	159 (23,2%)	16 (11,3%)	525 (76,8%)	125 (88,7%)	9,902	0,002
Blood level of electrolytes	35 (38,9%)	140 (19,0%)	55 (61,1%)	595 (81,0%)	18,887	<b>&lt;0,001</b>
Blood level of creatinine	140 (27,4%)	35 (11,1%)	371 (72,6%)	279 (88,9%)	30,733	<b>&lt;0,001</b>
Blood level of cholesterol	141 (28,6%)	34 (10,2%)	352 (71,4%)	298 (89,8%)	40,013	<b>&lt;0,001</b>
Blood level of triglycerides	41 (26,1%)	134 (20,1%)	116 (73,9%)	534 (79,9%)	2,789	0,095
LDL	34 (26,8%)	141 (20,2%)	93 (73,2%)	557 (79,8%)	2,776	0,096
ECG	160 (20,5%)	15 (33,3%)	620 (79,5%)	30 (66,7%)	4,184	0,041
Ophthalmoscopy	82 (20,1%)	93 (22,3%)	326 (79,9%)	324 (77,7%)	0,599	0,439
Echo-cardioscopy	75 (34,7%)	100 (16,4%)	141 (65,3%)	509 (83,6%)	31,957	<b>&lt;0,001</b>
Kidney ultrasound	85 (27,8%)	90 (17,3%)	221 (72,2%)	429 (82,7%)	12,546	<b>&lt;0,001</b>
Doppler of carotid arteries	3 (30,0%)	172 (21,1%)	7 (70,0%)	643 (78,9%)	0,468	0,494
Daily proteinuria	16 (25,0%)	159 (20,9%)	48 (75,0%)	602 (79,1%)	0,596	0,440
Ankle-brachial index	1 (33,3%)	174 (21,2%)	2 (66,7%)	648 (78,8%)	0,265	0,607
Glucose-tolerance test	6 (7,7%)	169 (22,6%)	72 (92,3%)	578 (77,4%)	9,422	0,002
Ambulatory blood pressure measurement	80 (18,0%)	95 (25,0%)	365 (82,0%)	285 (75,0%)	6,048	0,014
Pulse wave velocity	27 (93,1%)	148 (18,6%)	2 (6,9%)	648 (81,4%)	92,950	<b>&lt;0,001</b>

- Identification of blood pressure in both arms was conducted in 544 patients (65.9%);
  - Identification of blood pressure at the legs was conducted in 13 patients (1.6%);
  - Auscultation of the neck vessels was performed in 30 patients (3.6%);
  - Auscultation projected renal artery was performed in 12 patients (1.5%);
  - Study of blood count was conducted in 799 patients (96.8%);
  - Research urinalysis was performed in 792 patients (96.0%);
  - Research blood level of glucosae was conducted in 684 patients (82.9%);
  - Research electrolyte content in plasma was performed in 90 patients (10.9%);
  - Research creatinine content in plasma was conducted in 511 patients (61.9%);
  - Study of cholesterol was conducted in 493 patients (59.8%);
  - Research of triglycerides was performed in 157 patients (19%);
  - Research of LDL content was conducted in 127 patients (15.4%);
  - Performing of ECG was performed in 780 patients (94.5%);
  - Conduct ophthalmoscopy was performed in 408 patients (49.5%);
  - Holding Echo-cardioscopy was conducted in 216 patients (26.2%);
  - Conduct renal ultrasonography was performed in 306 patients (37.1%);
  - Performing Doppler carotid arteries was performed in 10 patients (1.2%);
  - Identify the daily proteinuria was performed in 64 patients (7.8%);
  - Definition of ankle-brachial index was performed in 3 patients (0.4%);
  - Conduct glucose-tolerance test was performed in 78 patients (9.5%);
  - Appointment of ambulatory blood pressure monitoring was performed in 445 patients (53.9%);
  - Identification of pulse wave velocity was performed in 29 patients (3.5%).
- To determine the quality and availability surveys conducted in urban and rural areas was conducted build contingency tables.



Defining coverage survey on the distribution of city or village found that the significant difference observed indicators for determining blood pressure on both arms - not detected in 94% of cases in rural and 6.0% in urban areas ( $p = 0.001$ ); not determined blood glucose in 88.7% and 11.3% of rural and urban populations, respectively ( $p = 0.002$ ); not determined by the level of electrolytes in the blood 81% (rural) and 19% (urban areas) ( $r < 0.001$ ); not determined by creatinine blood in 88.9% of cases in rural areas and 11.1% in urban areas ( $p < 0.001$ ); Blood cholesterol is not determined in 89.8% and 10.2% in rural and urban areas ( $p < 0.001$ ); ECG was not performed in 66.7% of cases in rural areas and 33.3% in the city ( $p = 0.041$ ); not conducted Echo-cardioscopy in 83.6% of cases in rural areas and 16.4% in (b  $< 0.001$ ) and renal ultrasound in 82.7% and 17.3% respectively ( $p < 0.001$ ); not produced glucose-tolerance test in 77.4% rural and 22.6% in the city ( $p = 0.002$ ); not ambulatory blood pressure monitoring was performed in 75% and 25% in rural and urban areas ( $p = 0.014$ ); not determined pulse wave velocity in 81.4% of cases in rural areas and 18.6% in cases ( $p < 0.001$ ) (tab. 1).

As a result of our intervention, in the peer review was found 66.4% (548 cases) with isolated hypertension and 33.6% (277 cases) with hypertension combined with coronary artery disease.

Of the 477 patients (57.8%) were trained regarding lifestyle modifications, 488 patients (54.3%) provided recommendations for the prevention and cardiovascular diseases and associated risk factors.

The results of peer review found that dynamic of BMI is available in 434 patients (52.6%), limiting salt intake observed in 519 patients (62.9%), restricting the use of coffee and tea is observed in 394 cases (47.8%), optimization level of physical activity observed in 403 patients (48.8%), modification of eating behavior by limiting harmful products marks the 455 patients (55.2%), waiver / reduction rate of smoking observed in 302 patients (36.6%).

Analysis of medical records found that 587 patients (71.2%) provided to clarify the need for treatment; 525 patients (63.6%) conducted training on driving ambulatory monitoring of blood pressure and maintaining a blood pressure diary; in 558 patients (67.6%) where treatment plan, a written justification of the treatment plan available to medical card 366 (44.4%).

As a result of 193 patients (23.4%) achieved target blood pressure through the implementation of the recommendations concerning the optimization behavior towards risk factors, lifestyle.

As a result of the model of primary prevention of CVD as part of medical care at the primary level by upgrading lifestyle short-term effects is the reduction in the population prevalence of behavioral risk factors for cardiovascular disease, and the great length of time, this leads to a decrease in morbidity and primary output disability due to cardiovascular diseases and cardiovascular events and reduce the proportion of cardiovascular diseases in the structure of causes of death.

The evaluation shows a decrease morbidity during the years 2013-2015 the incidence of CVD from 10 thousand to 471.4. 466.9 of the population to 10 thousand. Population.

The incidence of lymphoma in forms reduced the period for hypertension from 200.5 to 186.5 per 10 thousand of population and ischemic heart disease decreased from 125.5 to 121.6 and 127.7 increased to 10 thousand of population.

Investigating mortality due to cardiovascular disease found that the mortality rate in 2013 is 16.7 per 100 thousand of population, in 2014 it is 17.1 per 100 thousand of population in 2015 slightly decreased to 17.0 per 100 thousand of population.

Indicator of cardiovascular disability due to decreases from 1.2 to 10 thousand of population in 2012 to 0.8 per 10 thousand of population in 2015.

## CONCLUSIONS

According to our model were identified indicators for assessing its effectiveness, which is divided into indicators of process - assessment of the quality evaluation of patients with risk factors for cardiovascular diseases (history taking, examination, blood pressure control, auscultation neck vessels and renal arteries), coverage of patients' laboratory (analysis blood and urine biochemical markers) and additional (instrumental examination, examination of narrow specialists, functional test) methods of screening and accessibility of information on cardiovascular diseases (the number of public service announcements and information sources).

## REFERENCES

1. Хорош М. В. Голованова І. А. Сучасні погляди на проблеми профілактики серцево-судинних захворювань (за матеріалами Всесвітньої федерації серця). Східноєвропейський журнал громадського здоров'я. 2016, № 1 (26). С. 125–126.
2. Cooney M. T., Vartiainen E., Laatikainen T. [et al.]. Cardiovascular risk age: concepts and practicalities. Heart. 2012, Vol. 98. P. 941–946.
3. O'Flaherty M., Buchan I., Capewell S. Contributions of treatment and lifestyle to declining CVD mortality: why have CVD mortality rates declined so much since the 1960s? Heart. 2013, Vol. 99. P. 159–162.
4. Baena C. P., Chowdhury R., Schio N. A. [et al.]. Ischaemic heart disease deaths in Brazil: current trends, regional disparities and future projections. Heart. 2013, Vol. 99. P. 1359–1364.
5. Ntsekhe M., Damasceno A. Recent advances in the epidemiology, outcome, and prevention of myocardial infarction and stroke in sub-Saharan Africa. Heart. 2013, Vol. 99. P. 1230–1235.
6. Князькова І. І. Профілактика внезапной сердечной смерти при сердечной недостаточности: фокус на блокаторы АТ1-ангиотензиновых рецепторов. Ліки України. 2014, № 3/4. С. 74–80.
7. Цанько І. І., Мархонь І. П., Римаренко П. В. [та ін.]. Аналіз медико-соціальних втрат в результаті гіпертонічного кризу на амбулаторно-поліклінічному етапі. Медицина невідкладних станів. 2013, № 3 (50). С. 157–159.
8. Дячук Д. Д., Рингач Н. О., Чернобрівенко О. О. Нові підходи до реалізації стратегії боротьби з артеріальною гіпертензією в Україні: роль антигіпертензивного центру. Україна. Здоров'я нації. 2012, № 2/3. С. 300–306.
9. Пузанова О. Г. Інформаційні технології профілактики серцево-судинних захворювань у первинній ланці охорони здоров'я: дієвість консультування щодо фізичної активності та здоров'я. Східноєвропейський журнал громадського здоров'я. 2011, № 2 (14). С. 68–73.

10. Хорош М. В., Голованова І. А. Состояние сердечно-сосудистой патологии в Полтавской области за 2009-2014 года: заболеваемость, распространенность, смертность. Life and health of the person through the prism of the development of medicine, food safety policy and preservation of the biodiversity. – Pre-reviewed materials digest (collective monography) published following the results of CVI International Research and Practice Conference and II stage of the Championship in Medicine and Pharmaceutics, Biology, Veterinary Medicine and Agriculture (London, 26-31.08.2015). IASHE. London, 2015. P.22–36.
11. Khorosh M. V., Harkavenko M. O., Holovanova I. A. Risk factors for development of hypertension in Poltava region. Wiadomosci Lwkarskie. 2016, T. LXIX, № 2, cz. II. S. 190–197.
12. Хорош М. В., Голованова І. А. Модернізація способу життя як спосіб первинної профілактики серцево-судинної патології. Україна. Здоров'я нації. 2016, № 1/2 (37-38). – С. 212–218.
13. Baudet M., Daugareil C. Therapeutic education in primary cardiovascular prevention. Interests and limits. Ann Cardiol Angeiol (Paris). 2014, № 21. P. 235–241.
14. Лисак В.П., Голованова І.А., Закрутько Л.І., Хорош М.В. Науково-методичні підходи до модернізації способу життя людей, що мають фактори ризику артеріальної гіпертензії. Методичні рекомендації. Протокол №87.16/193.16 від 29.09.2016 р. Київ: Б.В. 2017. 34 с.

---

**ADDRESS FOR CORRESPONDENCE**

**Maxim V. Khorosh**

tel.: +380965387040

e-mail.: indarion0@gmail.com

**Nadesłano:** 20.04.2017

**Zaakceptowano:** 20.05.2017